Program code for the microprocessor **412** is stored in the memory device **432** which preferably comprises a 4 kilobyte erasable programmable read-only memory (EPROM) and a 1 kilobyte random access memory (RAM), and is connected to the microprocessor and other components via data, address and control buses **421**, **423** and **425**, respectively. A serial communications interface **436** is connected to the microprocessor via the address, CPU and control buses **423**, **425** and **427** to operate as a serial data interface to an external EIA terminal (not shown) for keyboard entry and printing output. The user I/O interrupt port **422** is also connected to a load interrupt generator **438**. The user I/O interrupt port provides interrupt signals from the load interrupt generator to the microprocessor on the CPU bus **425** in response to data signals received from any of three time clock generators **440**, **442** and **444** or from the magnetic reed switch **81**. The load interrupt generator **438** generates an interrupt signal on the control bus **427**, when, for example, TCG output signals indicate that the container has not been inserted in the inlet cone **64**, or there is a hole in the discharge tube. An interrupt can also be generated when a power reset button **448** is depressed.

The microprocessor **412** controls the piston electromagnetic coil **114**, the microstep motor **318** and the helical windings for driving the electromagnets **164** of the impeller by activating second, third and fourth relays **450**, **452** and **454**, respectively. As will be described in further detail below in connection with the flow chart in FIG. B, data concerning the speed of the impeller **168**, the flow rate of the mastic as determined by the position of the wear plates with respect to the impeller, and the thickness of the mastic being pumped is derived using signals from the first, second and third time clock generators. A template program for the mastic being pumped is stored in the EPROM portion of the memory device **432**. A comparator program in the memory device **432** compares output signals from the three time clock generators with template program values to determine if pump internals, e.g., the helical windings associated with the electromagnets **164** or the microstep motor **318**, need to be modified. Corrections are made until the signals from the time clock generators correspond to values stored in the template program, or a system malfunction has occurred.

The time clock generators are preferably programmable, multi-function digital time relay/counters, model no. 12 VDC CNT-35-26, available from Potter and Brumfield, a Siemens company located in Princeton, Ind. The operator switch is preferably a double-pole double-throw type relay. The magnetic reed switch is preferably a model FP-7628 switch available from Aromat Corporation of 629 Central Avenue, Edison, N.J. The first relay **414** is preferably a model no. LR26550 relay available from Nais. The second, third and fourth relays **450**, **452** and **454**, respectively, are each DS-C unit relays, model no. RND-C-SU, also available from Nais. The magnetic windings in the piston are preferably a Delta Max model available from Arnold Manufacturing Company of Edison, N.J. Finally, the microstep motor is preferably a DC motor model No. 3M15MO12P1 available from Sterling Instrument Co., New Hyde, N.J.

With reference to the flow chart in FIG. **23**, relay **1** is not activated (block **466**) until the magnetic reed switch **81** and the operator switch **416** on the dispensing head **16** are thrown (blocks **462** and **464**). As stated previously, each container is provided with a rubberized magnetic strip. The strips are characterized by different levels of magnetism measured in units gauss corresponding to different types of mastic in the containers. The inlet cone gasket comprises a plurality of magnetic reed switches arranged along the inner periphery thereof. Each reed switch responds to a relatively precise amount of magnetic attraction. Thus, when the container is inserted into the inlet cone gasket, one of the magnetic switches in the gasket is thrown in response to that particular gauss reading. The magnetic reed switch is preferably a binary enable type switch which causes the microprocessor to run a program stored in the memory device **432** as long as the switch is on, that is, the strip on the container is in contact with the inlet cone gasket.

With continued reference to the flow chart in FIG. B, the microprocessor is initialized (block **468**). During initialization, the microprocessor is provided with preprogrammed optimal values for the three TCGs in a template program stored in the memory device **432**. The values correspond to the type of mastic in use as determined by the gauss level on the magnetic annular ring of the container. For example, the value for the TCG **2** is initialized to a corrected time value, which corresponds to the type of mastic in use, from a range of values, i.e., –5 through +5. If the TCG **2** is set to a +3, the correction plates are set to a steeper angle than if the TCG **2** were initialized at zero. Correspondingly, the correction plates are initialized at a smaller angle if the time value is set at –3 that if it were set to a neutral value such as zero.

With continued reference to block **468**, the microprocessor adjusts preset time values and sets interrupt positions. For example, the microprocessor is programmed to vary the periods during which it will disable or enable interrupt signals on bus **425**. If a particular type of high viscosity mastic is being used which is characterized by a relatively high solid coagulant content, the period during which interrupt signals are disabled can be shortened, as compared to the period used for a mastic with lower viscosity. This is because the system is more likely to be malfunctioning if the TCG values are offset from the programmed values. Interrupt positions refer to registers from which the microprocessor can retrieve data for comparison purposes, as well as registers containing memory locations of appropriate correction sub-routines. The microprocessor jumps to the appropriate correction sub-routine when an interrupt occurs.

With reference to block **470**, the first TCG **440** is commanded under program control to begin generating pulses. The rate of time pulse generation is determined in accordance with the value of a pull-up resistor associated with the TCG **1**. For example, the TCG **1** can generate straight line revolutions per minute (RPM) timing pulses between 0 and 5000 counts in 0.5 RPM increments. The speed of the impeller **168** is defined using a binary value corresponding to a desired number of revolutions per minute. The impeller rotation rate is preferably a constant rate established by the first TCG with the preset value for pulse generation for the TCG **1** being determined by the type of mastic in use. Thus, impeller speed can be monitored using TCG **1** output as a reference signal.

The CPU or enable/disable bus **425** is enabled, as shown in block **472**, to transport binary output signals from the three TCGs to the microprocessor. An enable master clock, e.g., the clock **418**, is used to monitor the periods of time during which the pumping apparatus is undergoing corrective measures (block **474**).

With reference to blocks **476**, **478** and **480**, the microprocessor is programmed to activate relays **2**, **3** and **4** to initialize the piston coil **114**, the microstep motor **318** and the impeller electromagnets **164**, respectively. As stated previously, the position and rate of motion for the piston **98**, the motor **318** and the impeller **168** is defined for the